EXECUTIVE SUMMARY

A. INTRODUCTION

This Executive Summary provides an overview of the principle findings and recommendations included in the Water System Capital Improvement Plan for the City of Bloomington Utilities (CBU). The Capital Improvement Plan provides a long-range plan for meeting water requirements through the year 2030.

B. POPULATION PROJECTIONS

Population is the most commonly used basis for estimating future water use. The Indiana Business Research Center (IBRC) forecasted the 2010 population for the City of Bloomington and Monroe County to be 64,391 and 120,000, respectively. The 2000 Census population for the City of Bloomington and Monroe County was 69,291 and 120,563, respectively. Since the Year 2010 population projections were already exceeded in 2000, revised population growth rates were required.

Three sets of projections were determined. The first set was based on the 1980-1990 growth rate. The second set was based on the 1990-2000 growth rate. The third set was based on a linear regression of the Census population between 1940 through 2000. The 1980-1990 growth rate produced more conservative results and was used for this Capital Improvement Plan. The population projections utilized for this study are presented in Table ES-1.

Table ES-1
Population Projections

Year	Bloomington	Monroe County
2005	75,008	126,783
2010	80,724	133,003
2020	94,043	146,729
2030	109,560	161,871

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On January 10, 2003, it was announced that the Interstate 69 Corridor would be routed through Bloomington. The estimated time to completion is anywhere from eight to fourteen years. This Capital Improvement Plan does not take into consideration the effect of the Corridor on the geographical distribution of the population or future development in the CBU service area because of the unknowns associated with its construction. Any future Capital Improvement Plans should take this into consideration.

C. WATER REQUIREMENTS

The projected water use for the CBU system was based on the population projections. Rates most important in the design and operation of a water system are average day (AD), maximum day (MD), and maximum hour (MH). A summary of the average day, maximum day, and maximum hour water use for base year 2000 and years 2010, 2020, and 2030 utilized for this study are presented in Table ES-2.

Table ES-2
Projected Water Use

Year	Average Day, mgd	Maximum Day, mgd	Maximum Hour, mgd
2000	13.1	20.6	24.5
2010	15.2	24.2	28.7
2020	17.2	27.7	32.9
2030	19.6	32.2	38.1

D. EXISTING FACILITIES

The City of Bloomington Utilities has relied on the 24 mgd Monroe Water Treatment Plant (WTP) as the sole source of treated water since the Griffy WTP was retired from service in 1996. The Monroe WTP treats water withdrawn from Lake Monroe to meet all current regulatory standards. The processes at the

Monroe WTP include rapid mixing, sedimentation, filtration, and disinfection. The facility is connected to the Bloomington water distribution system by a single 36-inch transmission main that conveys treated water approximately 8 miles from the plant to the City. Any interruption in service, either at the WTP, along the transmission main, or with any of the critical ancillary water treatment facilities, for more than a few hours could result in a significant reduction or total suspension of water service to CBU's customers.

E. REGULATORY REQUIREMENTS

CBU's proposed new water treatment plant or expansion of the existing Monroe WTP will be designed and constructed during a period of rapid and unprecedented changes within the water industry. These changes are being driven by new regulations implemented in response to federal legislation; by the introduction of new water treatment processes, which have expanded many utilities' capabilities to meet specific treatment requirements; and by rising consumer expectations regarding the quality of their water supplies.

Review of pending and anticipated future regulatory requirements suggests that there are several water quality/treatment-related parameters that will likely need to be addressed in the design of any future treatment expansion utilizing either the existing Lake Monroe supply or a new surface water or ground water supply. For expansion scenarios utilizing surface water sources, provisions for the following will likely need to be included:

- Capability to consistently achieve finished water turbidities of 0.1 NTU or lower in order to minimize the potential for passage of microbial pathogens through the treatment process.

- Ability to maintain TTHM and HAA5 concentrations at less than 0.080 mg/L and 0.060 mg/L, respectively, throughout the entire CBU distribution system.

- Incorporation of a process to inactivate *Cryptosporidium* oocysts, if required under the impending Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR). This would likely involve primary disinfection utilizing ultraviolet light irradiation, or (if the LT2ESWTR is promulgated as currently drafted) use of membrane technology to remove oocysts.

For expansion scenarios utilizing ground water sources, compliance with regulatory requirements would generally be more easily achieved than for surface water supplies. However, compatibility issues would need to be carefully evaluated in order to avoid conditions where intermixing of existing surface water supplies and new ground water supplies could lead to water quality problems within CBU's distribution system. Generally this would involve adjustment of finished water pH and alkalinity to ensure that precipitation or dissolution of existing deposits does not occur upon mixing of the treated ground water and surface water supplies.

CBU has expressed interest in membrane technology to meet future turbidity and possible *Cryptosporidium* removal requirements, and to provide their customers high quality drinking water. CBU, with the assistance of B&V, completed a membrane filtration pilot study in Year 2002. The pilot study indicated good results using membrane filtration with Lake Monroe as a water source. The pilot study indicated that with membranes, CBU could consistently achieve finished water turbidities of less than 0.1 NTU. Therefore, membrane technology has been assumed for expansion of the existing Monroe WTP or a new WTP using a surface water supply. In addition, if a new WTP is constructed with membrane filtration, CBU would like to include membranes at the existing Monroe WTP as well. Therefore, alternatives that involve a new WTP will also include retrofitting the existing Monroe WTP with membranes.

F. HYDRAULIC ANALYSES

Hydraulic analyses were performed for maximum day and maximum hour conditions for Base Year 2000 and Design Year 2030 to identify distribution

system deficiencies and to evaluate water treatment expansion alternative improvements. Analyses were not necessary for Design Years 2010 and 2020 since there were very little distribution system improvements required between 2000 and 2030 to meet the future water use conditions.

In addition to the Base Year 2000 and Design Year 2030 analyses, a series of year 2030 maximum day analyses were conducted with water demands increased globally to 36 mgd to match three water treatment plant expansion alternatives that CBU is considering to meet future water demands. The three alternatives, designated as Alternative A, B, and C, are described as follows:

- **Alternative A.** Expand the 24 mgd Monroe WTP to a capacity of 36 mgd. This alternative would require another 30-inch raw water line to be installed from the intake to the plant and a parallel 36-inch finished water transmission main from the plant to the proposed 30-inch Southeast main that connects to the existing 36-inch main near Harrell Road and Moffat Lane. This alternative also includes the proposed 30-inch Southeast main along Harrell Road; a new Southeast pump station and tank located near Harrell and Rhorer Roads; a 36-inch main along Rhorer to Sare Road; a 24-inch North branch main along Sare Road to the existing 24-inch main in Moores Pike and a 24-inch West branch main along Rhorer Road, then north along South Rogers Street to West Country Club Drive, then west along Country Club Drive to connect to the two existing 24-inch mains at the intersection of Rockport and West Tapp Roads.

- **Alternative B.** Construct a new 12 mgd Dillman WTP expandable to 24 mgd, adjacent to the Dillman WWTP near Dillman Road and Victor Pike. Raw water would be conveyed through a 36-inch transmission main from a new intake located near the Indiana Department of Natural Resources site on Lake Monroe. From the Dillman WTP's high service pumps, finished water would be conveyed through a 36-inch transmission main into two 24-inch Central service level mains at Rockport and Tapp Roads and a 16-inch main

along West Country Club Drive between Rockport Road and South Old SR 37. The capacity of the Monroe WTP would remain at 24 mgd.

- **Alternative C.** Construct a new North 12 mgd WTP expandable to 24 mgd, near Bottom Road and new State Route 37. Raw water would be conveyed through a 36-inch transmission main to the new plant. From the new North plant, finished water would be conveyed through a 36-inch transmission main to the Central service level mains near Stonemill Road and Old State Route 37. If the North plant is expanded to 24 mgd, then the 36-inch main should be extended as a 24-inch main along Walnut Street to the existing 24-inch main on 20th Street. The capacity of the Monroe WTP would remain at 24 mgd.

G. EVALUATION OF WATER SYSTEM IMPROVEMENTS

A list of advantages and disadvantages were developed as part of the evaluation of the alternatives. The following is a summary of the advantages and disadvantages identified during the evaluation process:

1. Alternative A – Expand Monroe WTP from 24 mgd to 36 mgd

a. Advantages

- The proposed Southeast transmission main will provide redundancy to the existing 36-inch transmission main from the Monroe WTP to the South Tanks.

- If a break should occur in one of the two finished water transmission mains, CBU can continue to provide up to 24 mgd to the distribution system.

- The proposed Southeast pump station would provide water to the Central service level if the South-Central pump station is off-line or if there is a break in the existing 36-inch transmission main serving the South-Central pump station.

- Lake Monroe is used, which has an abundant supply of good quality raw water.

- There is familiarity with the water supply.

- Expanding the Monroe WTP is the most economical of the three alternatives.

b. Disadvantages

- It does not provide an independent second water source.

- The Monroe WTP cannot be easily expanded past 36 mgd.

2. Alternative B – Construct a new 12 mgd Dillman WTP

a. Advantages.

- The intake facility can be expanded easily to a capacity of 24 mgd.

- Residuals can be pumped to the Dillman WWTP for processing, thereby eliminating the need for a residuals dewatering facility.

- Treated water is pumping directly into the Central service level, thereby eliminating the need for the Fullerton pump station and tank previously proposed by CBU.

- Provides 12 mgd of treated water to the system in the event that the Monroe WTP or intake is off-line or if there is a break in the existing 36-inch finished water transmission main.

- Having two separate withdrawal locations on Lake Monroe provides a greater level of security than with a single supply and treatment facility.
- Lake Monroe is used, which has an abundant supply of good quality raw water.
- There is familiarity with the water supply.

b. Disadvantages

- Increases O&M costs by having a second water treatment plant and staff.
- Has high capital cost.

3. Alternative C – Construct a New 12 mgd North WTP

a. Advantages

- The water supply is independent of Lake Monroe, and provides a greater level of security as compared to a single supply and treatment facility.
- Provides 12 mgd of treated water to the system in the event that the Monroe WTP or intake is off-line or if there is a break in the existing 36-inch finished water transmission main.
- Less pumping head is required conveying water to the northern extremities of the distribution system from the proposed North WTP than from the existing Monroe or proposed Dillman WTP.
- Residuals can be pumped to the Blucher Poole WWTP for processing, thereby eliminating the need for a residuals dewatering facility.

b. Disadvantages

- Increases O&M costs by having a second water treatment plant and staff.
- Requires a new collector well and associated piping to expand the plant to 24 mgd.

- Has water quality compatibility concerns related to the mix of treated surface water and groundwater.

- Has high capital cost.

4. Option to Alternative C – Construct a New 12 mgd North WTP Using Surface Water Supply (Lake Lemon, Bean Blossom Creek, and Griffy Lake).

a. Advantages

- Water supply is independent from Lake Monroe, which provides a greater level of security as compared to a single supply and treatment facility.

- Provides 12 mgd of treated water to the system in the event that the Monroe WTP or intake is off-line or if there is a break in the existing 36-inch finished water transmission main.

- Less pumping head is required conveying water to the northern extremities of the distribution system from the proposed North WTP than from the existing Monroe or proposed Dillman WTP.

- Residuals can be pumped to the Blucher Poole WWTP for processing, thereby eliminating the need for a residuals dewatering facility.

b. Disadvantages

- The water source likely does not have sufficient yield to support expansion of the proposed 12 mgd plant in the future without other sources to supplement the North supply.
- Increases O&M costs by having a second water treatment plant and staff.

The proposed treatment processes for each alternative are described in Chapter 7. The recommended water supply, treatment, and distribution system improvements are shown on Figure 7-1.

H. PRELIMINARY OPINION OF PROBABLE CONSTRUCTION AND PROJECT COSTS

All of the probable construction and project costs presented herein reflect price levels for the Year 2002. The probable construction costs include an allowance of 20 percent for contingencies, but do not include any allowance for administration, legal, and engineering costs; CBU staff salaries or expenses related to the project; permit or plan review fees; or costs for surveying, subsurface investigations, land acquisition, easements, or unusual construction conditions other than those specifically identified herein.

The total probable project costs for each alternative includes the probable construction costs; administration, legal, and engineering costs; costs for surveying and subsurface investigations; cost for pilot studies and investigations; land and easement acquisition; and bond issuance costs.

The opinion of probable construction costs, probable project costs, and projected additional increase in water rates in Year 2008 for the alternatives is as follows:

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Alternative	Total Probable Construction Cost	Total Probable Project Cost	Projected 2008 Additional Rate Increase
Alternative A Expand the existing Monroe WTP from 24 to 36 mgd using membrane filtration.	$46,200,000	$58,970,000	51.3 %
Option to Alternative A Expand the existing Monroe WTP from 24 mgd to 30 mgd, initially using membrane filtration.	$39,900,000	$50,916,000	44.3 %
Alternative B New 12 mgd Dillman WTP with Lake Monroe supply using membrane filtration. Retrofit existing Monroe WTP with 24 mgd membranes.	$62,400,000	$79,982,000	72.8 %
Alternative C New 12 mgd North WTP with groundwater supply using membrane filtration and RO for softening. Retrofit existing Monroe WTP with 24 mgd membranes.	$74,100,000	$95,427,000	91.7 %

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Alternative	Total Probable Construction Cost	Total Probable Project Cost	Projected 2008 Additional Rate Increase
Option 1 to Alternative C New 12 mgd North WTP with groundwater supply using gravity media filtration and RO for softening. Retrofit the existing Monroe WTP with 24 mgd membranes.	$68,400,000	$88,120,000	83.6 %
Option 2 to Alternative C New 12 mgd North WTP using Lake Lemon, Bean Blossom Creek, and Griffy Lake supplies. Retrofit the existing Monroe WTP with 24 mgd membranes.	$46,500,000	$60,155,000	55.6 %

I. PROPOSED ALTERNATIVES

The financial evaluation indicates that expanding the capacity of the Monroe WTP (Alternative A) is the most economical of the alternatives. This alternative includes expanding the capacity of the Monroe WTP using membrane filtration; constructing new parallel raw and finished water mains to convey the additional flow; and constructing the Southeast Water System Improvements which will convey the additional treated water from the South service level to the Central service level. The new and existing finished water transmission mains and the firm pumping capacity between the South service level and Central service level would support up to 42 mgd of flow. It may be feasible that the Monroe WTP could ultimately be expanded to 42 mgd in the future. The disadvantages to this option are that the treatment facilities and site would not easily support further

expansion, and would not provide the same level of redundancy as compared to a new separate treatment facility.

The North WTP alternative using Lake Lemon, Bean Blossom Creek and Griffy Lake as a water supply (Option 2 to Alternative C) is only slightly more expensive than expanding the Monroe WTP. The proposed North WTP would have a capacity of 12 mgd and could be used as a peaking plant, supplementing the Monroe WTP to meet maximum day demands. Based on past yield studies, the North surface water sources should have a firm annual yield of approximately 6 mgd. However, this plant could provide up to 12 mgd of treatment capacity as long as the annual average plant capacity remained at approximately 6 mgd. This alternative provides several benefits, including the security of having two water sources and good hydraulics associated with providing water to customers from the North. It should be noted that this water source may not have sufficient yield to support expansion of the proposed WTP beyond 12 mgd in the future without other sources to supplement the North supply. Other sources may include blending groundwater with the North surface water supplies or possibly conveying raw water from another surface water source to the North plant as a supplement. If this alternative is selected, a study should be performed to verify the yield and water quality of the water sources and the proposed treatment processes.

Both the proposed Dillman WTP using Lake Monroe as the water supply (Alternative B) and the North WTP using a groundwater supply (Alternative C and Option 1 to Alternative C) have several non-economic advantages over the other alternatives. These include the security and reliability of two separate plants and their ability to be easily expanded from 12 mgd to 24 mgd in the future. The existing Monroe WTP also could be expanded, if additional capacity is needed in the future.

J. IMPROVEMENTS SCHEDULE

As the projected water demands for the Year 2010 is expected to exceed the capacity of the existing Monroe WTP, it is recommended that the proposed water system improvements be completed and operational in the Year 2008. This will necessitate starting construction by January 2006. CBU should complete any final pilot studies and/or investigations by Spring 2004 and begin design by late Spring or early Summer 2004 to ensure sufficient time is allowed to complete the design phase; obtain all permits and approvals; acquire all necessary land and easements; accept bids; and award the construction contract by January 2006.

As this capital improvements program represents an important and critical decision on the direction of the water utility, it is paramount to include the public in the selection of the alternatives described herein. The schedule allows several months for obtaining input and comments through public meetings prior to making a decision and proceeding with the capital improvements program.

It is recommended that CBU make a final decision regarding the proposed water system improvements in the Year 2003. This should allow adequate time to complete all phases of the project and have the new facilities operational by mid-Year 2008.